

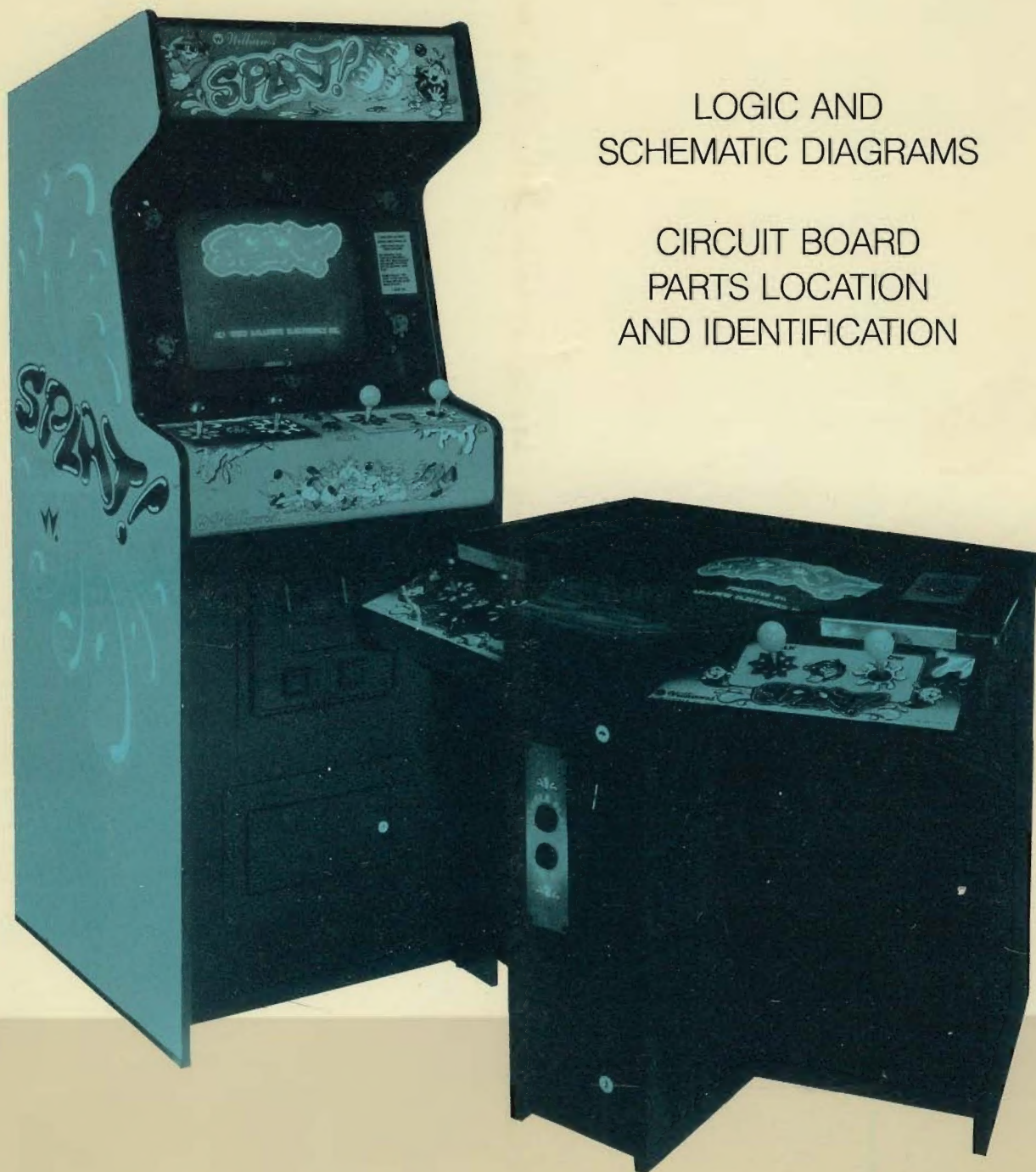
Williams®

Drawing Set



LOGIC AND
SCHEMATIC DIAGRAMS

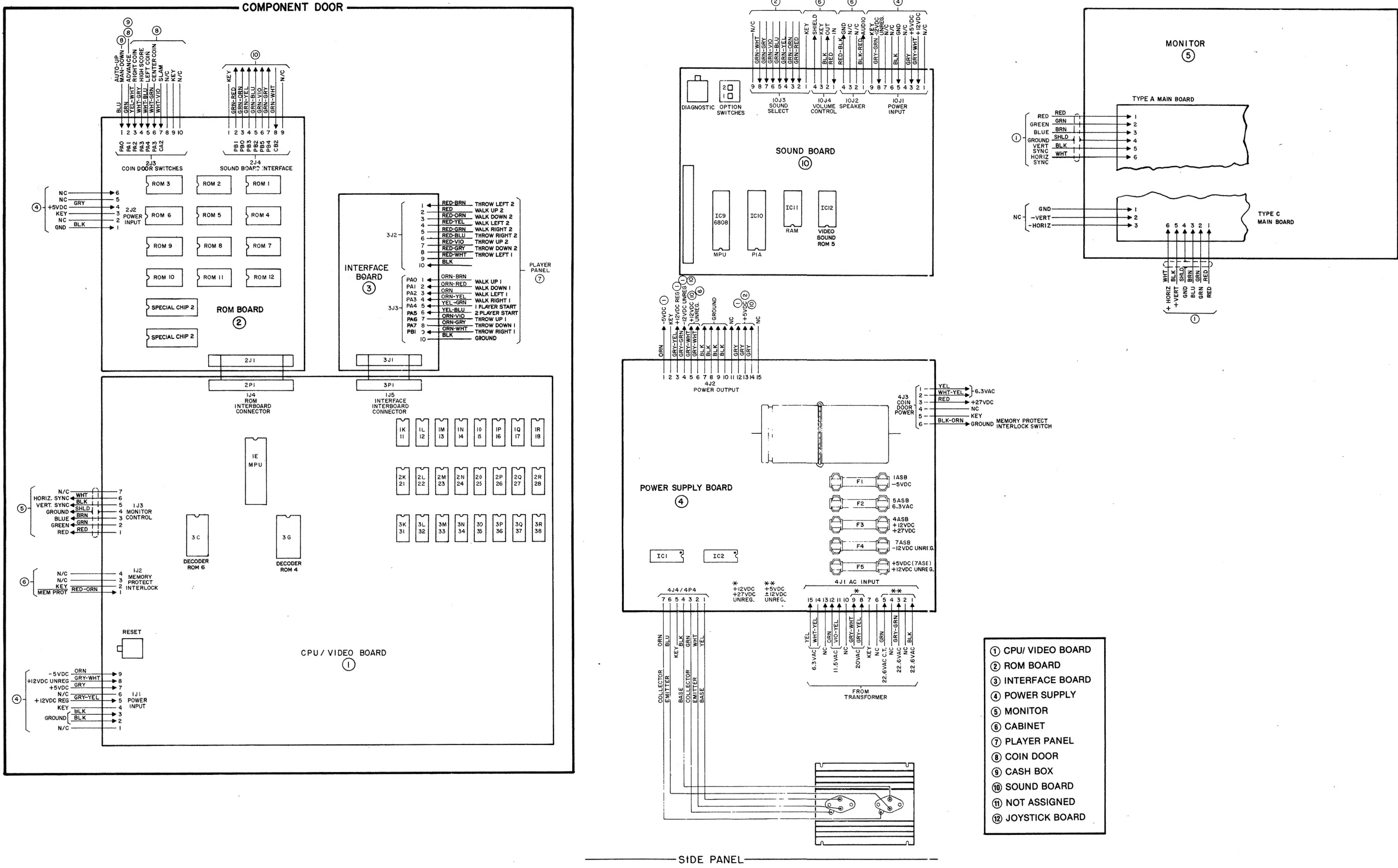
CIRCUIT BOARD
PARTS LOCATION
AND IDENTIFICATION



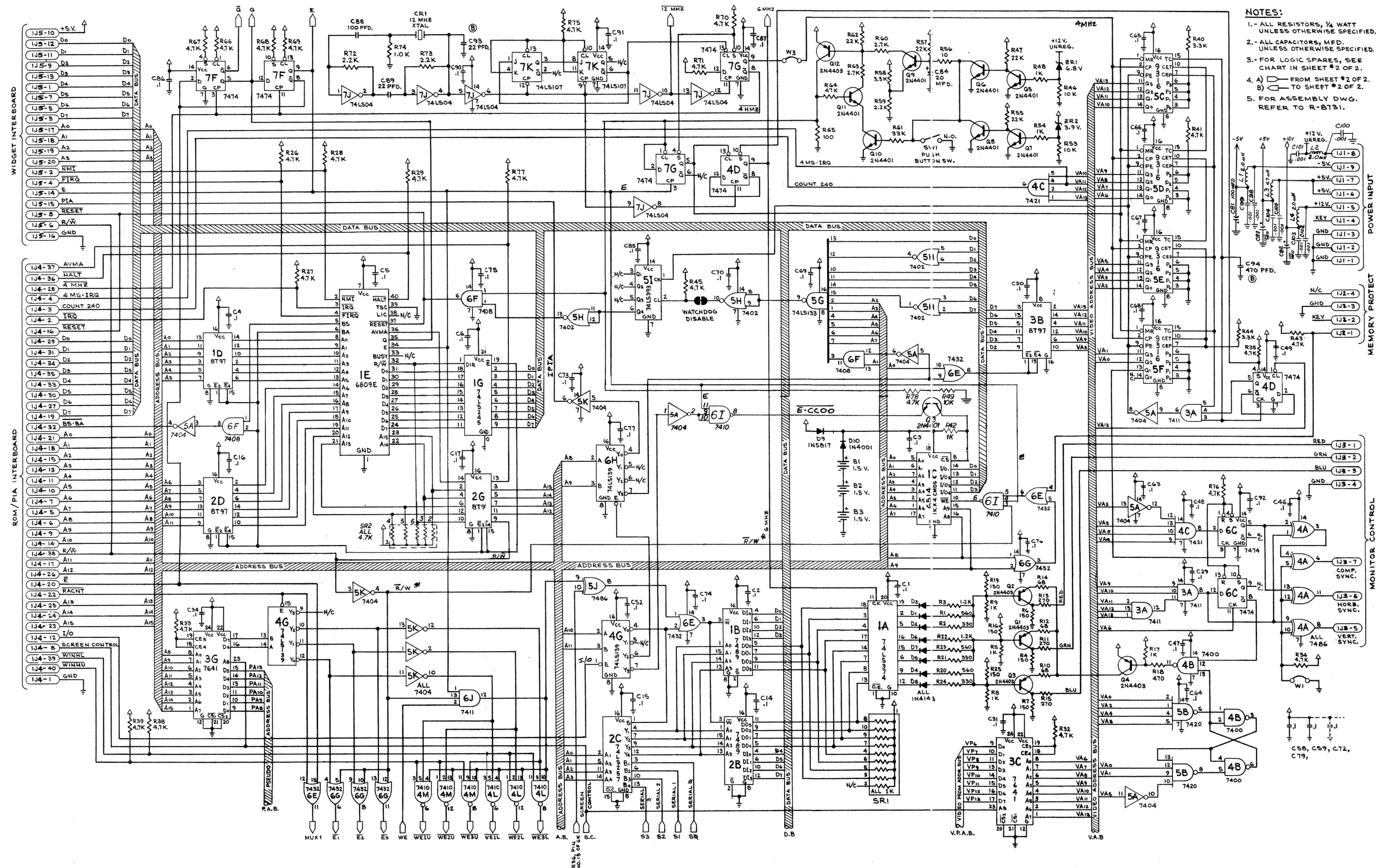
CONTENTS

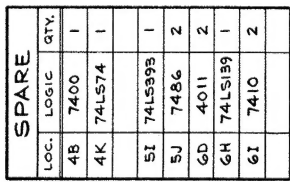
Interboard Wiring Diagram.....	1
CPU Board Assembly Drawing.....	2
CPU Board Logic Diagram (Sheet 1 of 2).....	3
CPU Board Logic Diagram (Sheet 2 of 2).....	4
Interface Board Assembly and Logic Diagram.....	5
ROM Board Assembly Drawing	6
ROM Board Logic Diagram	7
Power Supply Board Assembly Drawing	8
Power Supply Board Schematic Diagram.....	9
Power Wiring Diagram	10
Cabinet Assembly & Wiring Diagrams.....	11
D-8224 Sound Board Assembly Drawing	12
D-8224 Sound Board Schematic Drawing.....	13

INTERBOARD WIRING

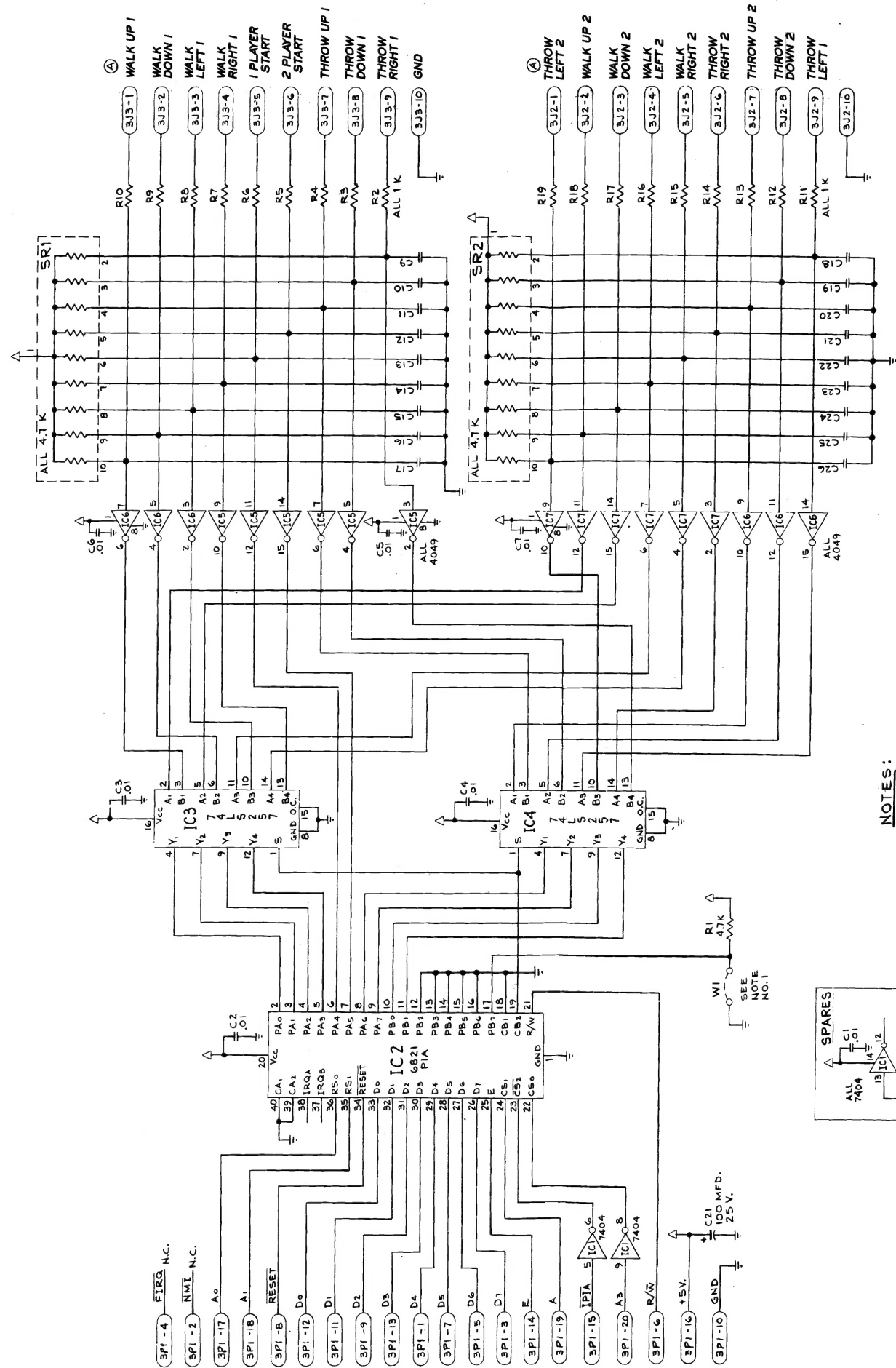
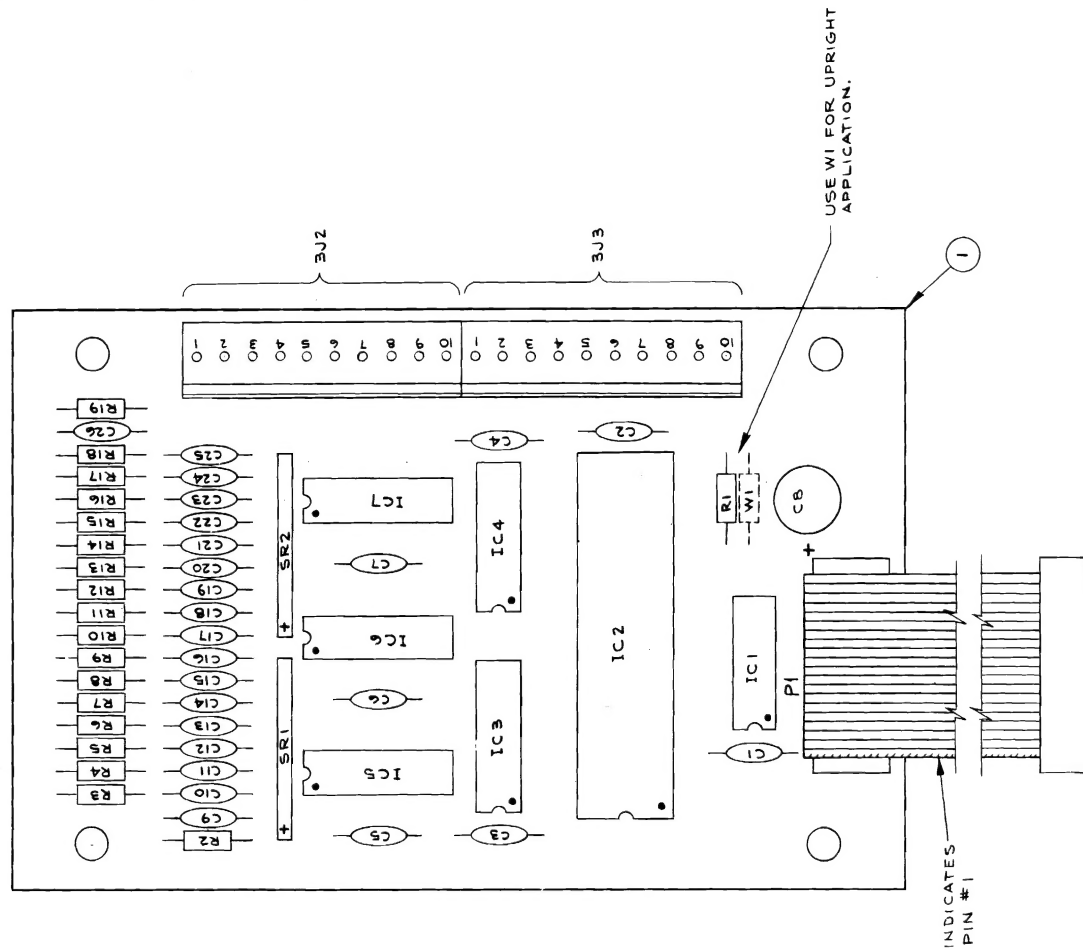


Interboard Wiring Diagram

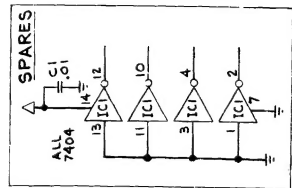




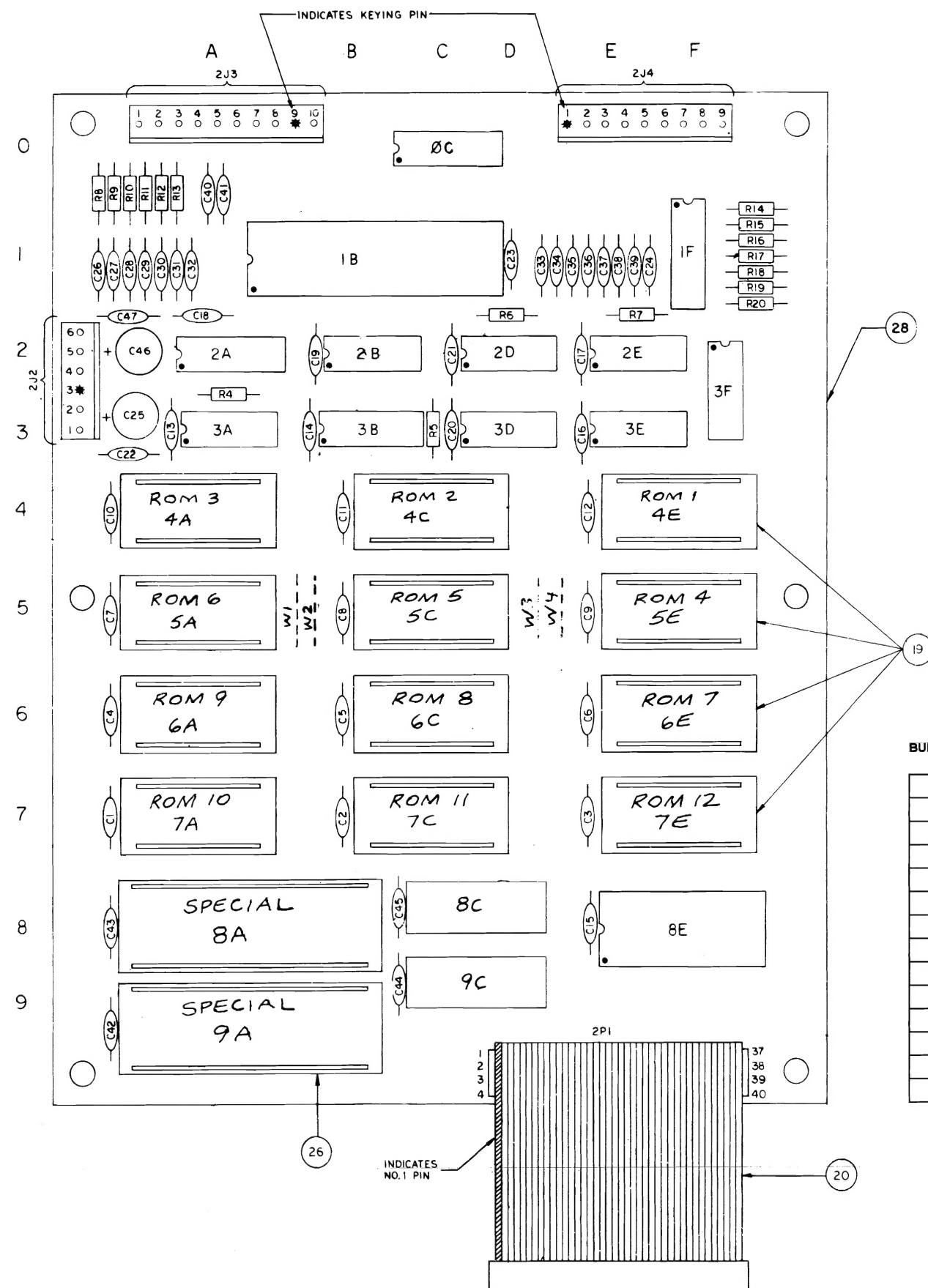
BILL OF MATERIAL				
ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	NO. REQ'D.
1	5772-09680-00		BARE P.C. BOARD	1
2	5430-08972-00	IC2	6821 PIA	1
3	5310-08975-00	IC5, IC6, IC7	4049 CMOS HEX INVERTOR	3
4	5280-09013-00	IC1	7404 HEX INVERTER	1
5	5281-09485-00	IC3, IC4	74LS257 QUAD DATA MULTIPLEXER	2
6	5019-09362-00	SR1, SR2	4.7K OHM 9 RES. 10 PIN SIP	2
7	5010-09358-00	R2 THRU R19	RESISTOR, C.F. 1K OHM 5% 1/4 WATT	18
8	5010-08991-00	R1	RESISTOR, C.F. 4.7K OHM 5% 1/4 WATT	1
9	5010-09534-00	W1	RESISTOR, C.F. 0 OHM 1/4 WATT	1
10	5043-09065-00	C8 THRU C26	CAPACITOR, CERAMIC DISC. 470 PFD. 50V. X7R ±20%	18
11	5040-09421-00	C8	CAPACITOR, ELECT. RADIAL 100 MFD. 25 VOLT, ±50-10%	1
12	5043-08980-00	C1 THRU C7	CAPACITOR, CERAMIC DISC. 0.1 MFD. 50V. ±80-20%	7
13	5795-09540-00	P1	20 PIN RIBBON CABLE ASSY.	1
14	5791-09444-00	3J2, 3J3	10 PIN HEADER 09-65-1101	2



NOTES:
1. USE W1 FOR UPRIGHT APPLICATION.
2. FOR ASSEMBLY DWG REFER TO C-8783



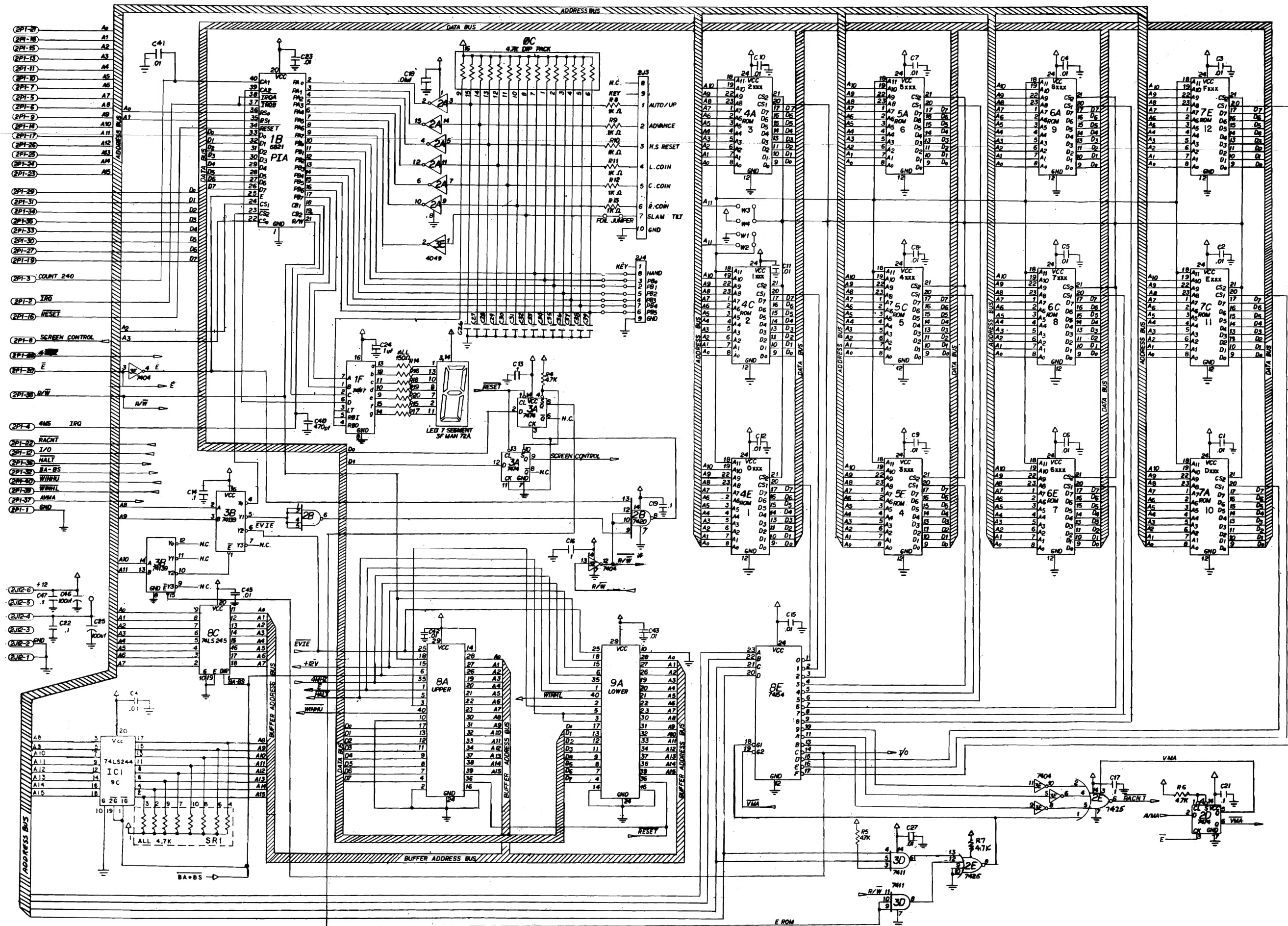
C-8783 Interface Board Assembly and Logic Diagram



BUBBLES

CHIP CODE	ROM #	PART #	COLOR
4E	ROM 1B	A-5343-10071-B	BROWN
4C	ROM 2B	A-5343-10072-B	BROWN
4A	ROM 3B	A-5343-10073-B	BROWN
5E	ROM 4B	A-5343-10074-B	BROWN
5C	ROM 5B	A-5343-10075-B	BROWN
5A	ROM 6B	A-5343-10076-B	BROWN
6E	ROM 7B	A-5343-10077-B	BROWN
6C	ROM 8B	A-5343-10078-B	BROWN
6A	ROM 9B	A-5343-10079-B	BROWN
7A	ROM 10B	A-5343-10080-B	BROWN
7C	ROM 11B	A-5343-10081-B	BROWN
7E	ROM 12B	A-5343-10082-B	BROWN
JUMPER			W1, W3

BILL OF MATERIALS				
ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D NO.
1	5771-09840-00		BARE PC BOARD	1
2	5280-09407-00	1F	7447BCD TO 7SEG LED DISPLAY	1
3	5280-09478-00	2D,3A	7474 DUAL-D TYPE FLIP-FLOP	2
4	5281-09246-00	3B	74LS139 DUAL 2 TO 4 LINE DECODER	1
5	5280-09530-00	2B	7420 DUAL 4-INPUT NAND	1
6	5280-09475-00	3D	7411 TRIPLE 3 INPUT AND	1
7	5280-09013-00	3E	7404 HEX INVERTERS	1
8	5280-09551-00	2E	DUAL 4 INPUT 7425 NOR GATE WITH STROBE	1
9	5280-09010-00	8E	74154 4 TO 16 LINE DEC./DEMULT.	1
10	5430-08972-00	1B	MC 6821 PIA	1
11	5019-09239-00	QC	4.7K 15 RES 16 PIN DIP PACK	1
12	5010-09187-00	R14 THRU R20	RESISTOR C.F. 150 OHM 5% 1/4 W	7
13	5010-08991-00	R4 THRU R7	RESISTOR C.F. 4.7K OHM 5% 1/4 W	4
14	5671-09411-00	3F	MAN 72A 7SEG LED DISPLAY	1
15	5043-08980-00	C1-C21, C23, C24, C42-45	CAP. CERAMIC .01 MFD 50V +80-20%	27
16	5040-09421-00	C25, C46	CAP ELEC 100 MFD. 25V RAD +50%-10%	2
17	5043-08996-00	C22, C47	CAP CERAMIC .1 MFD. 50V ±20%	2
18	5043-09065-00	C26 THRU C41	CAP CERAMIC 470 PFD. 50V AXIAL +/-20%	16
19	5700-09004-00		24-PIN IC. SOCKET	12
20	5795-09611-00	2P1	40 PIN RIBBON CABLE ASS'Y 5"	1
21	5791-09038-00	2J2	HEADER, 6 PIN, 09-65-1061	1
22	5791-09444-00	2J3	10 PIN MALE CONN 09-65-1101	1
23	5791-09027-00	2J4	9 PIN CONN 09-65-1091	1
24	5310-08975	2A	4049 INVERTING HEX BUF.	1
25	5010-09358-00	R8 THRU R13	RESISTOR C.F. 1K OHM 5% 1/4 W	6
26	5700-08985-00		40-PIN IC. SOCKET	2
28	D-9192		ROM/PIA BD. SUB-ASSEMBLY	1
29	SEE CHART	4A THRU 7E SEE CHART	GAME ROM ASSEMBLY	AS REQ'D
30	5010-09534-00	W1 THRU W4 SEE CHART	RESISTOR C.F. 0 OHM 1/4 WATT	AS REQ'D
31	5410-10083-00	8A, 9A	FULL CUSTOM I.C.	2
32	5281-09308-00	8C	I.C., 74LS245 OCTAL BUS/LINE DR/LINE RCVR	1



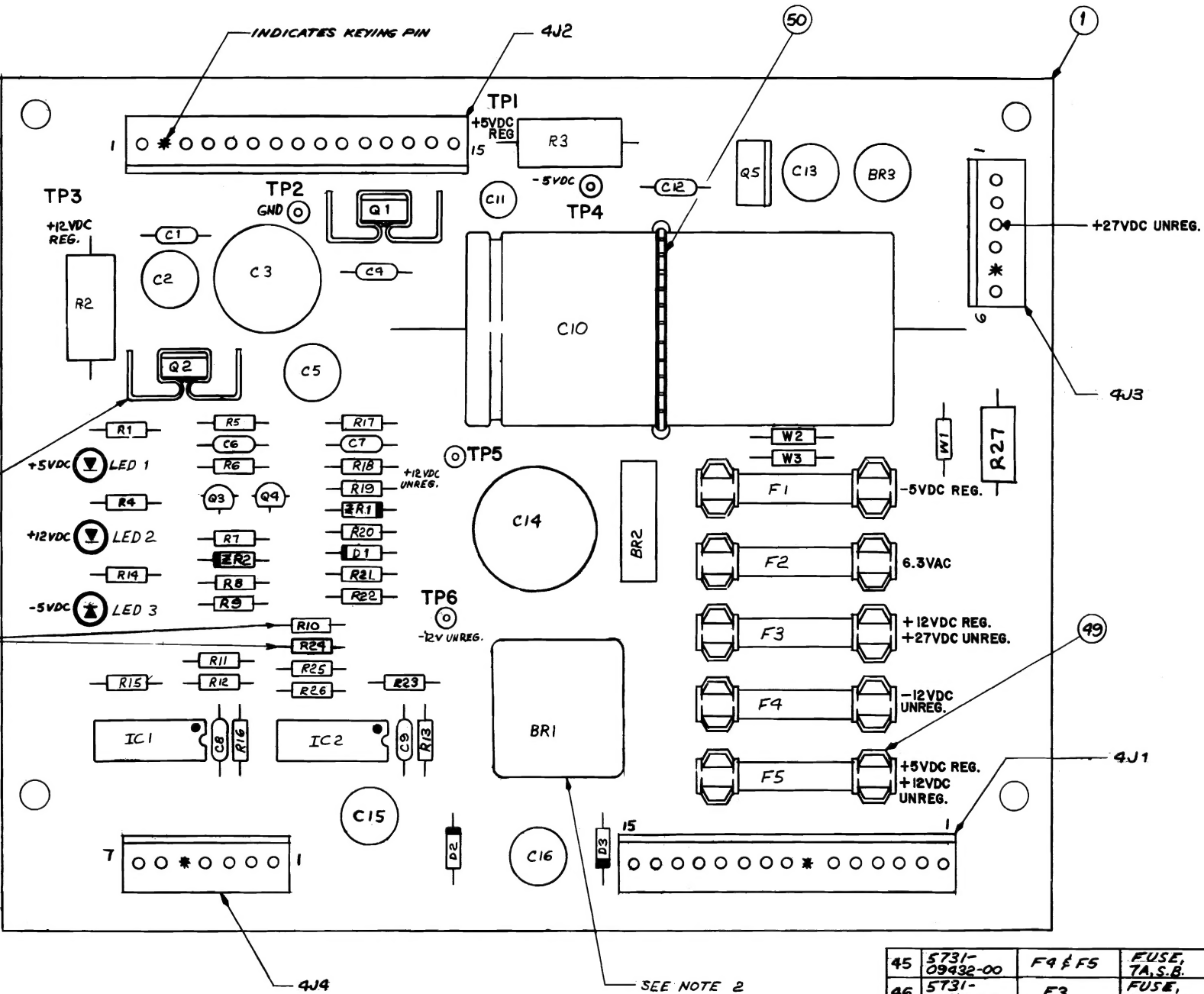
BILL OF MATERIAL

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D NO.
1	5773-09679-00		BARE P.C. BOARD	1
2	5010-09085-00	R23	RESISTOR, 1.5K 5%, 1/4 W	1
3	5010-08541-00	R13, R15	RESISTOR, 2.7K 2%, 1/4 W	2
4	5010-09508-00	R21	RESISTOR, 870Ω 2%, 1/4 W	1
5	5010-09428-00	R20	RESISTOR, 1.5K 2%, 1/4 W	1
6	5010-09509-00	R16	RESISTOR, 1.1K 2%, 1/4 W	1
7	5010-08510-00	R7	RESISTOR, 12K 2%, 1/4 W	1
8	5010-09314-00	R4	RESISTOR, 1.2K 5%, 1/4 W	1
9	5010-09416-00	R1, R14	RESISTOR, 470Ω 5%, 1/4 W	2
10	5013-09542-00	R11	RESISTOR, 7.32K 1%, 1/4 W	1
11	5013-09427-00	R12	RESISTOR, 9.99K 1%, 1/4 W	1
12	5013-09426-00	R25	RESISTOR, 2.15K 1%, 1/4 W	1
13	5012-09429-00	R3	RESISTOR, .12Ω 5%, 5 W	1
14	5012-09512-00	R2	RESISTOR, .27Ω 5%, 5 W	1
15	5012-09037-00	R27	RESISTOR, 0.4Ω 5%, 3 W	1
16	5013-09665-00	R26	RESISTOR, 5.11K 1%, 1/4 W	1
17	5010-09434-00	R6, R18	RESISTOR, C.F. 22Ω ± 5%, 1/4 W	2
18	5010-09036-00	R5, R9, R17, R22	RESISTOR, C.F. 100Ω ± 5%, 1/4 W	4
19	5010-09039-00	R8, R19	RESISTOR, C.F. 10Ω ± 5%, 1/4 W	2
20	5010-09534-00	W1	RESISTOR, 0Ω	1
21	5043-08996-00	C6, C7	CAPACITOR, 0.1μF CERAMIC +80% -20% 50V	2
22	5040-09421-00	C2, C16	CAPACITOR, 100MFD, 25V RADIAL +50% -10%	2
23	5040-09422-00	C15	CAPACITOR, 47 MFD, 50V RADIAL +50% -10%	1
24	5040-09420-00	C3	CAPACITOR, 1000MFD, 25V RADIAL +75% -12%	1
25	5040-09419-00	C10	CAPACITOR, 18,000MFD 20V AXIAL +75% -10%	1
26	5040-09423-00	C5	CAPACITOR, 330 MFD 10V RADIAL +50% -10%	1
27	5040-09504-00	C14	CAPACITOR, 4700MFD 35V RADIAL +50% -10%	1
28	5043-09446-00	C1, C4 & C12	CAPACITOR, 1MFD, 50V AXIAL 25V -20 +80%	3
29	5043-08065-00	C9	CAPACITOR, 470PFD 50V AXIAL XTR ± 10%	1
30	5043-09492-00	C8	CAPACITOR, 100 PFD 50V AXIAL S2L ± 5%	1
31	5040-09506-00	C13	CAPACITOR, 220MFD 16V RADIAL +50% -10%	1
32	5040-09493-00	C11	CAPACITOR, 22MFD 10V RADIAL +50% -10%	1
33	5070-08258-00	D1, D2 & D3	DIODE, IN4001	3
34	5075-09406-00	ZR1	ZENER, IN5234 ± 5% (6.2V)	1
35	5075-09662-00	ZR2	ZENER, IN5234 ± 5% (14V)	1
36	5190-09430-00	Q3, Q4	TRANSISTOR, MPS A55	2
37	5130-09661-00	Q1, Q2	SCR 8 AMP, 100 V	2
38	5250-09515-00	Q5	VOLTAGE REGULATOR, 7905	1
39	5460-09424-00	IC1, IC2	VOLTAGE REGULATOR, 723	2
40	5100-09899-00	BR1	BRIDGE RECTIFIER, 35 AMP, 200V	1
41	5100-09513-00	BR2	BRIDGE RECTIFIER, 4.0A, 50V	1
42	5100-09514-00	BR3	BRIDGE RECTIFIER, 1.0A, 50V	1
43	5671-09018-00	LED1, LED2, LED3	LED, RED	3
44	5824-09248-00	TP1-TP6	TERMINAL #1502-1 (TEST POINT)	4

(A)

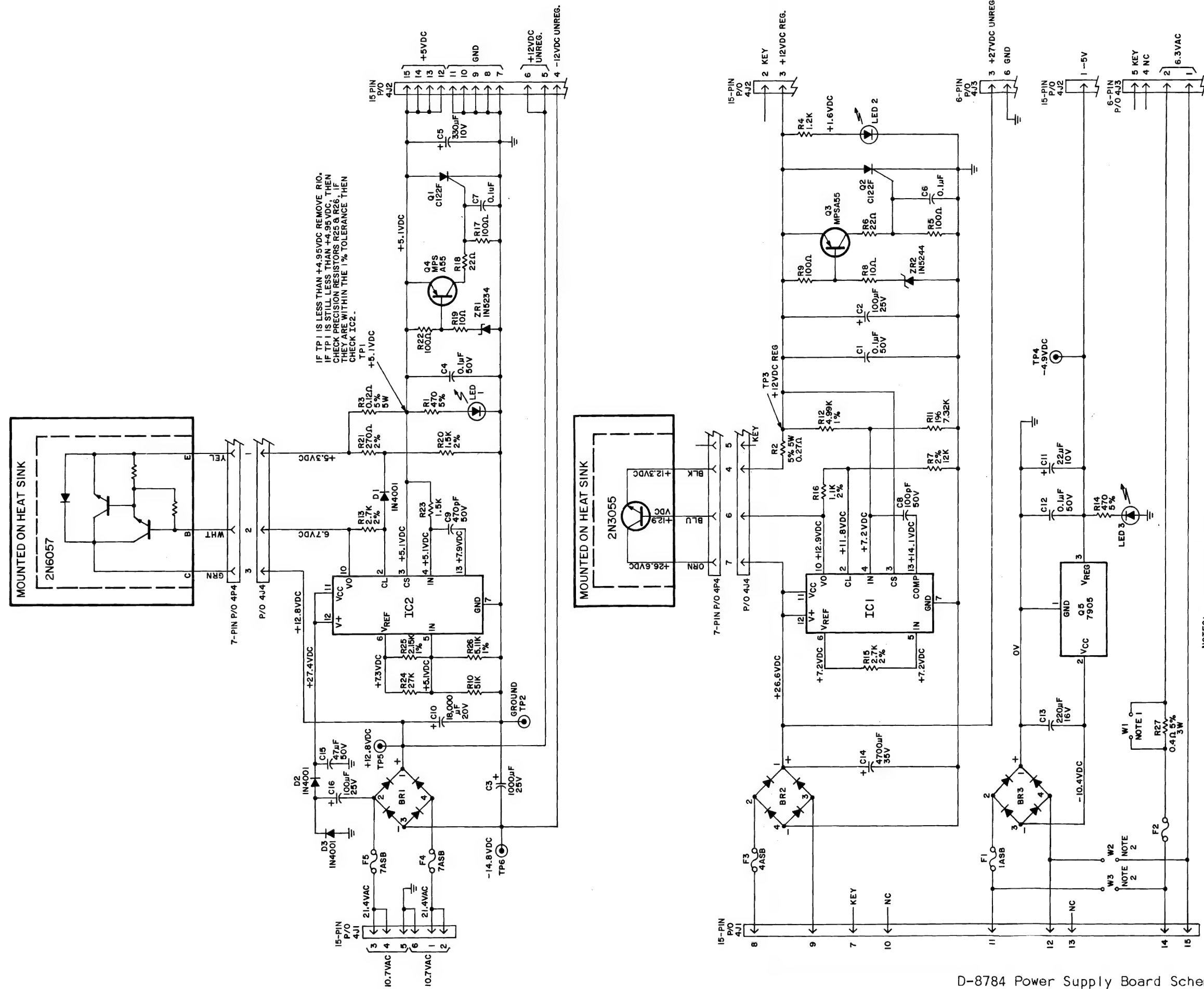
45	5731-09432-00	F4 & F5	FUSE, TA, S.B.	2
46	5731-06314-00	F3	FUSE, 9A, S.B., 250V	1
47	5731-06569-00	F1	FUSE, 1A, S.B., 250V	1
48	5731-09651-00	F2	FUSE, 3A, S.B., 250V	1
49	5732-09178-00		FUSEHOLDER,	10
50	03-T520		TIE WRAP	1
51	5791-09074-00	4J1 & 4J2	HEADER, 15 PIN 09-65-1051	2
52	5791-09030-00	4J3	HEADER, 6 PIN 09-65-1061	1
53	5791-09497-00	4J4	HEADER, 7 PIN 09-65-1071	1
54	5705-09663-00		HEAT SINK	2
	5705-09688-00		HEAT SINK	0

55	5010-09682-00	R10	RESISTOR C.F. 51K ± 5%, 1/4 W	1
56	5010-09324-00	R24	RESISTOR C.F. 27K ± 5%, 1/4 W	1
ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D NO.

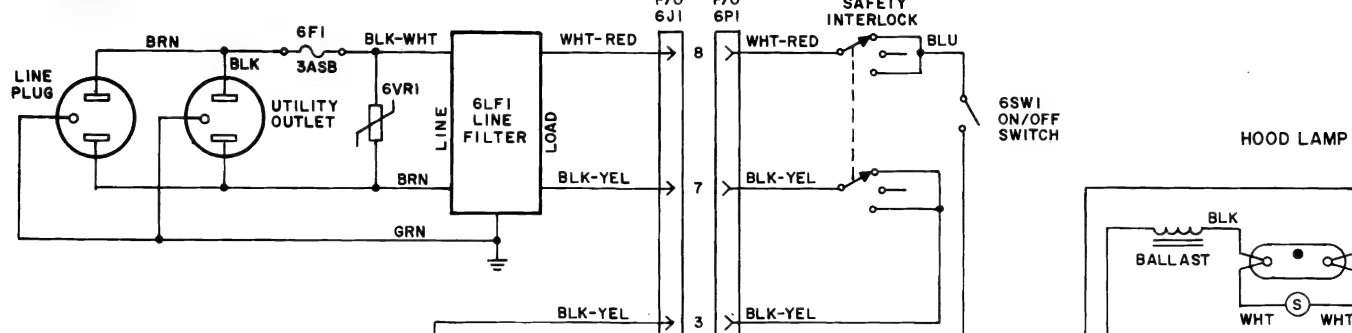


NOTES

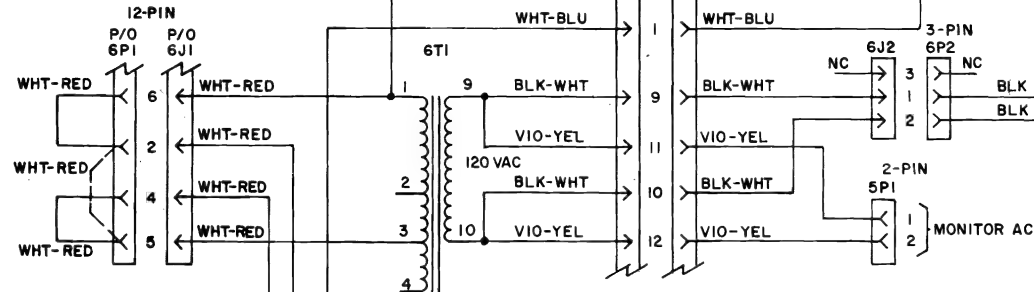
1. REMOVE R10 IF +5VDC IS LESS THAN 4.95 VDC.
2. BR1 MUST BE MOUNTED 1/8" ABOVE SURFACE OF BOARD.



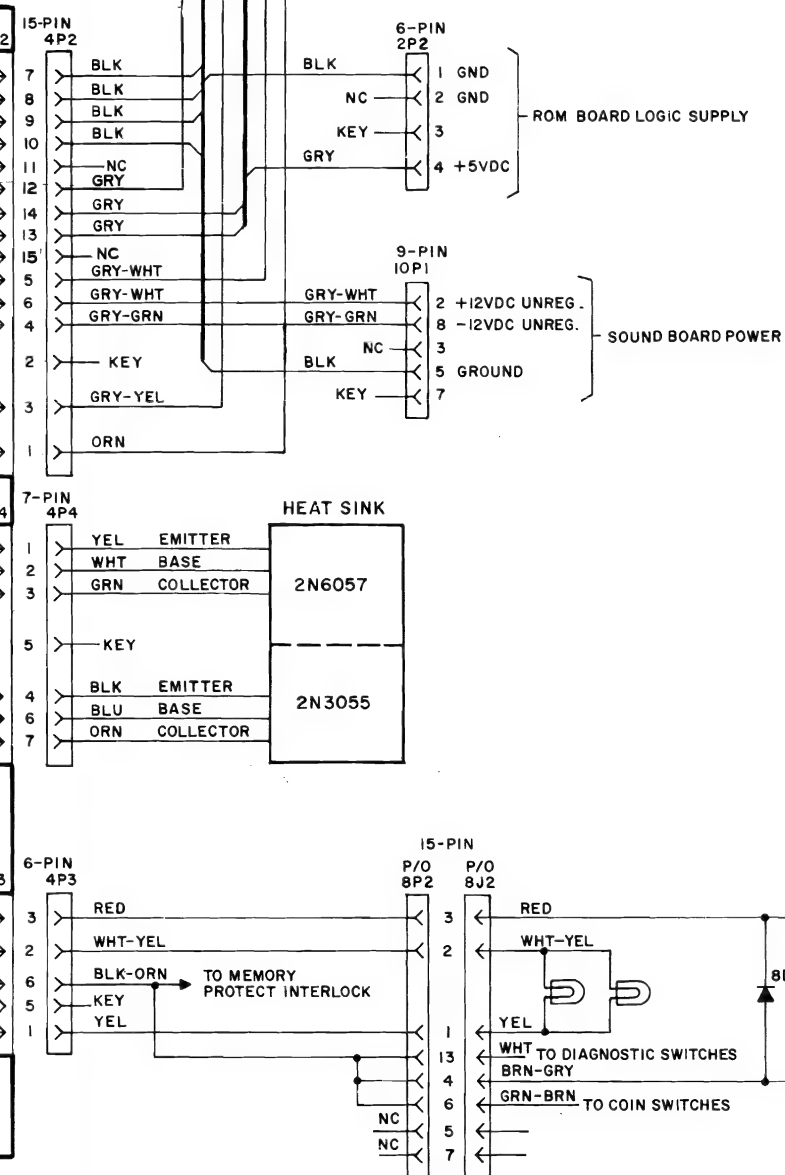
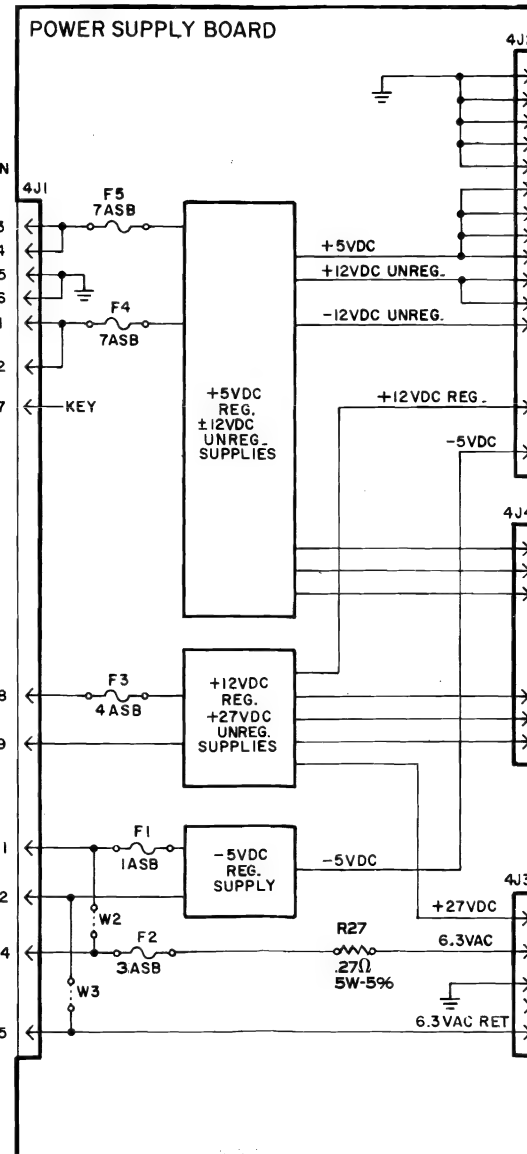
115VAC OR 230VAC INPUT
FOR SPECIFIED OUTPUT VOLTAGES



UPRIGHT MODEL

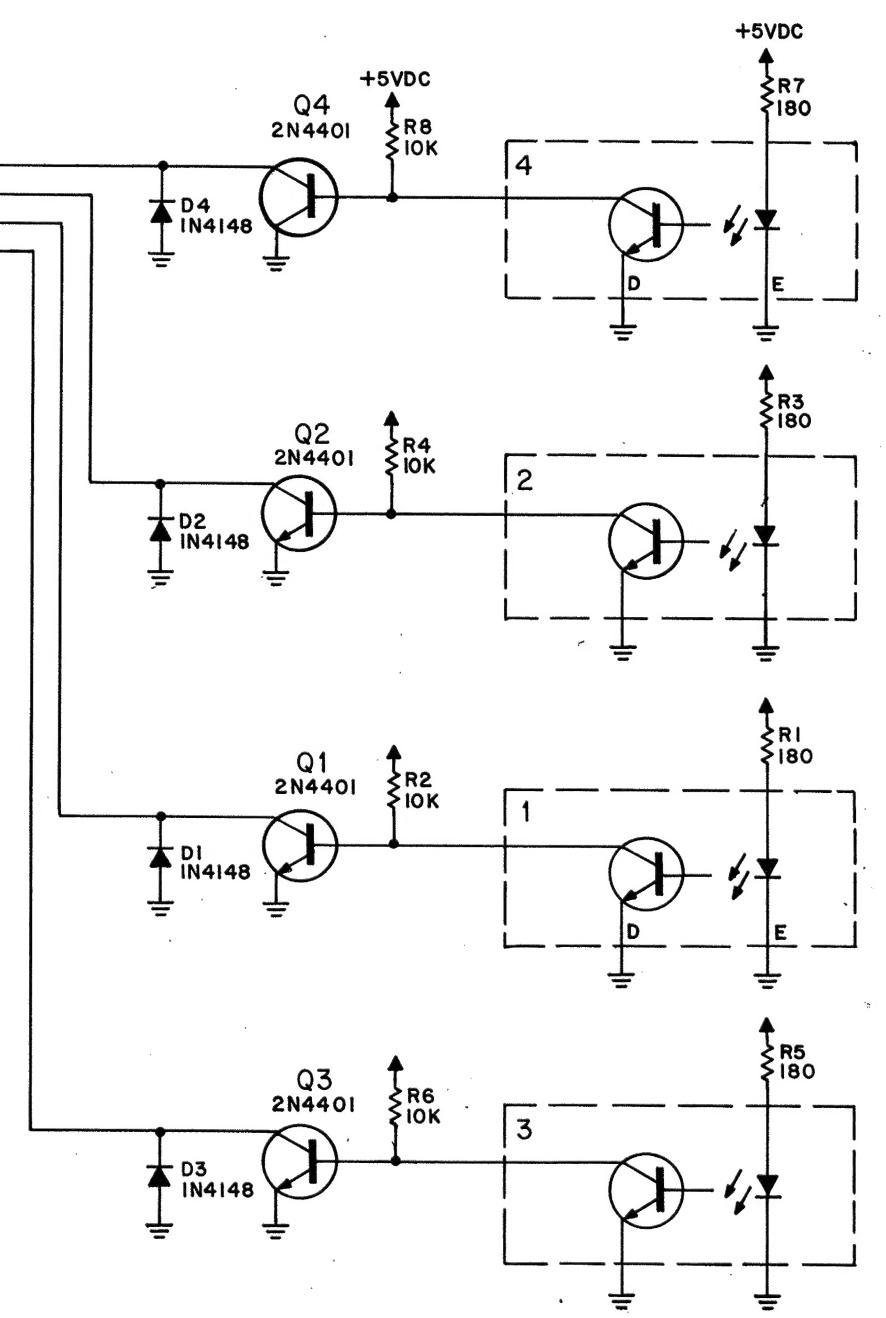
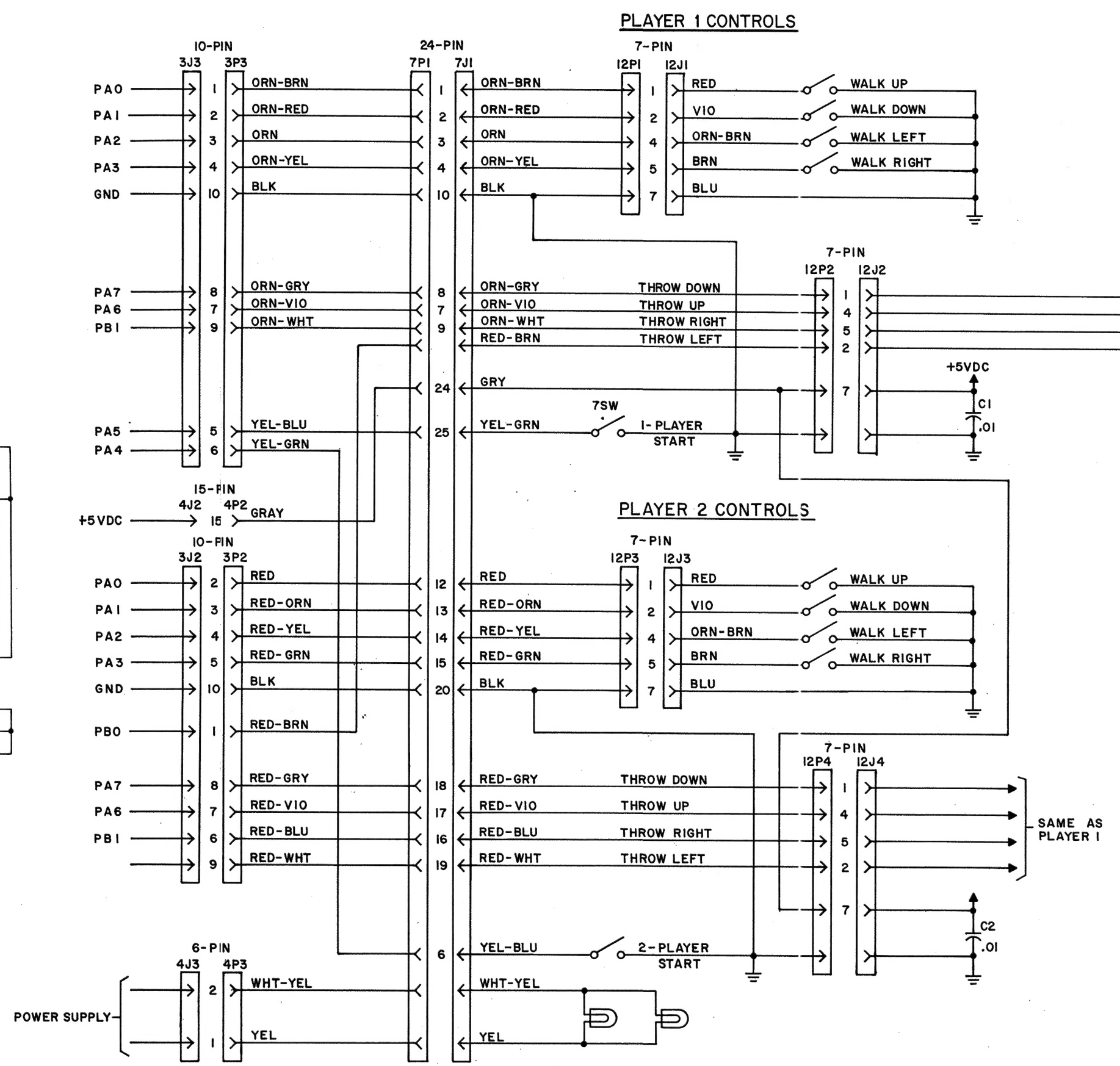
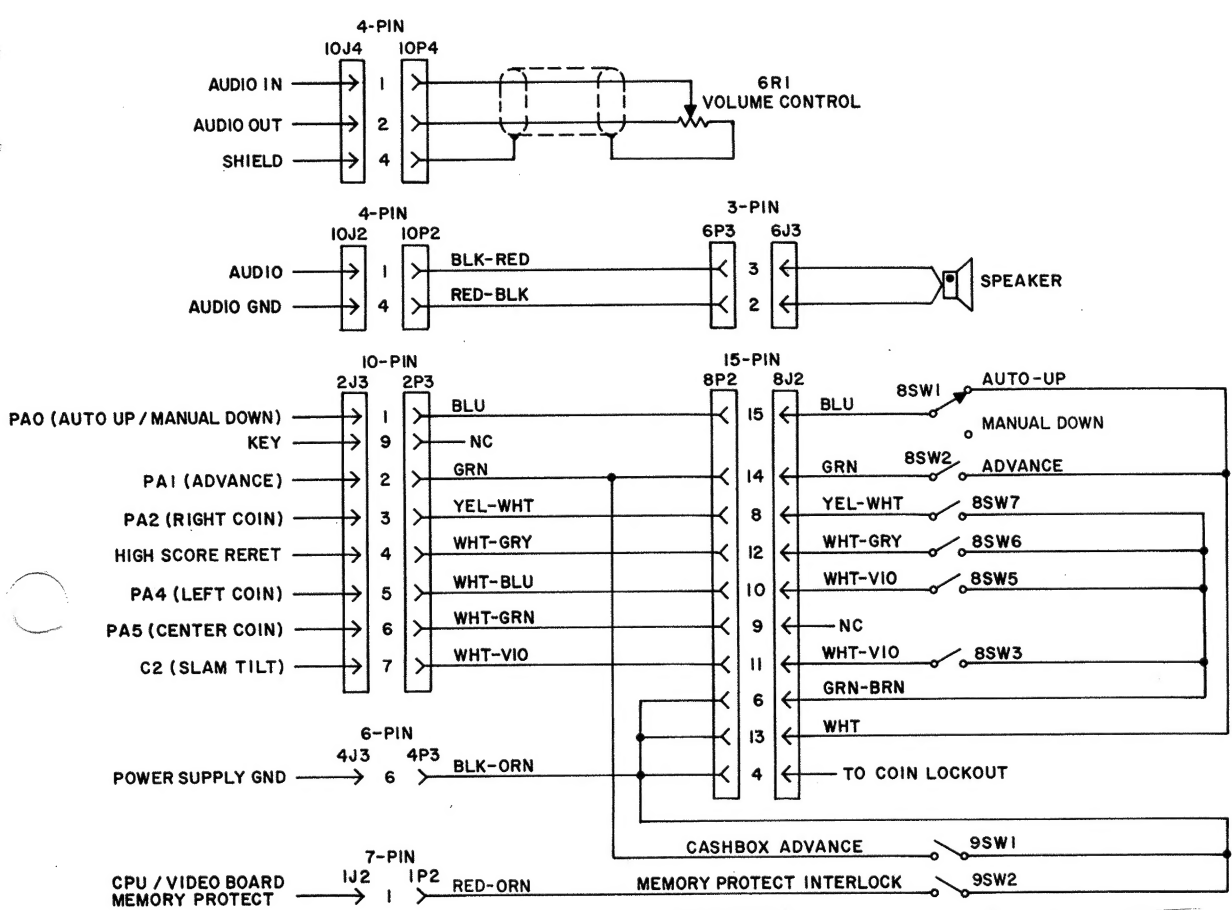


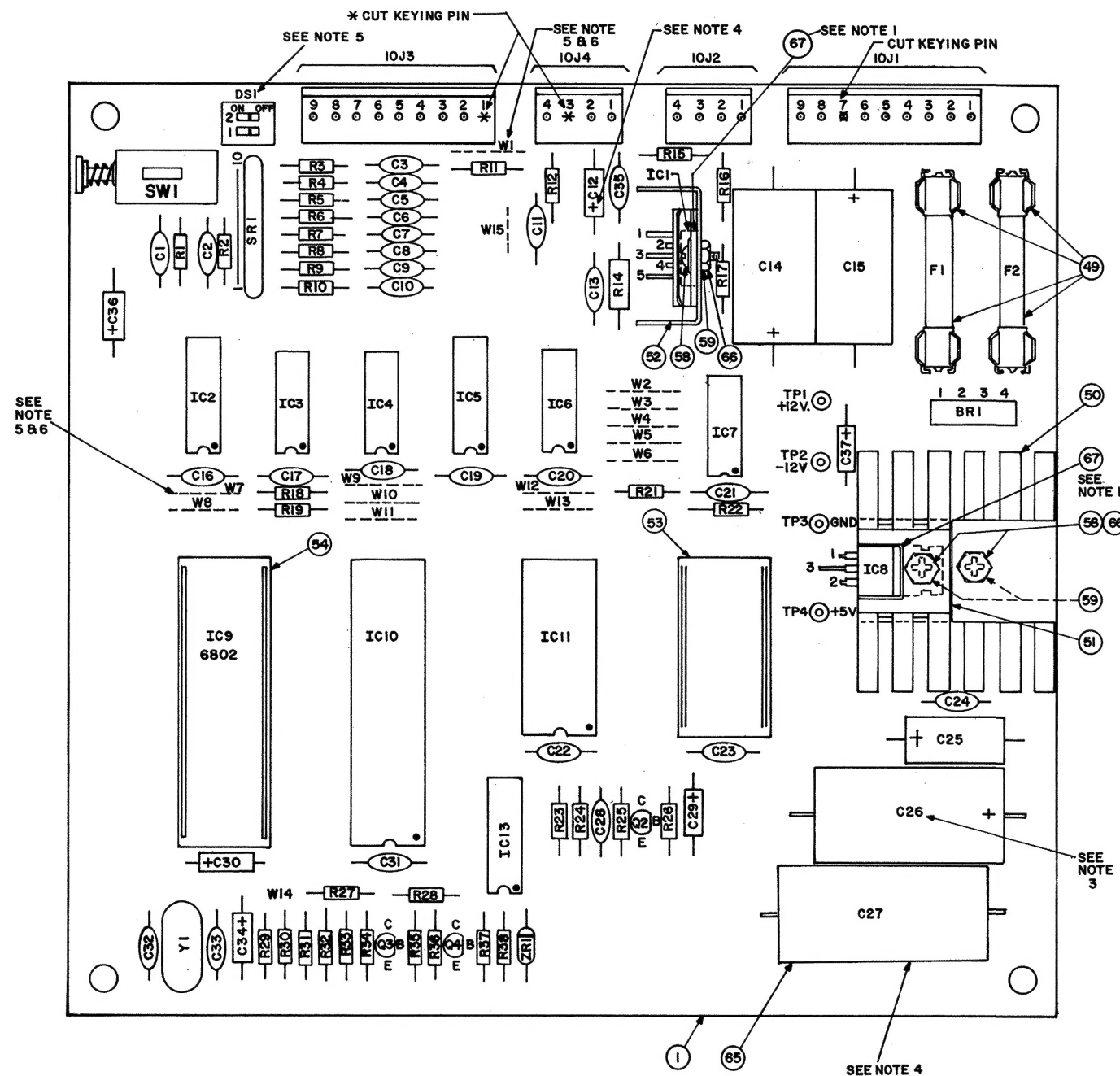
Transformer part no. 5610-09658-00



NOTES:

1. For 115VAC, 3A fuse and 130V varistor 5017-09044 are used.
2. For 230VAC, 1A fuse and 275V varistor 5017-09063 are used.
3. Jumper wires on 6P1 shown with solid lines are connected for 115VAC operation. Only the one shown with a dashed line is connected for 230VAC operation.
4. For low-line conditions (103.5 or 207.0VAC) move WHT-RED wire from 6T1-3 to 6T1-2 and move WHT-RED and WHT-BLU wires from 6T1-7 to 6T1-6.
5. For high-line conditions (132.0 or 264.0VAC) move WHT-RED wire from 6T1-3 to 6T1-4 and move WHT-RED and WHT-BLU wires from 6T1-7 to 6T1-8.





SOUND BOARD JUMPERS

JUMPERS USED	TOM TYPE	FORMAT	GAMES USED IN
W2, W5, W7, W9, W10, W15	2K x 8 2516, 2716	Sound & Speech	Gorgar, Blackout, Firepower, Black Knight, Jungle Lord, Pharaoh.
W1, W2, W5, W7, W9, W10, W15	2K x 8 2516, 2716	Sound Only	Defender Video & Pin, Solar Fire, Barracora, Hyperball, Stargate, Cosmic Gunfight, Varkon, Time Fantasy.
W3, W4, W5, W7, W10, W15	4K x 8 2532	Sound & Speech	Sinistar (Upright & Cockpit Front)
W1, W3, W4, W5, W7, W10, W15	4K x 8 2532	Sound Only	Robotron, Joust Video & Pin, Bubbles, Sinistar (Cockpit Rear)
W1, W2, W4, W5, W7, W10, W15	2K x 8 2516, 2716	Sound Only	Warlock
W1, W3, W6, W7, W9, W11, W12, W15	512 x 8 7641	Sound Only	Big Strike

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
1	01-2 01-146-6		BARE P.C. BOARD REV F	1
2	5370-09156-00	IC1	TDA 2002 V AUDIO AMPLIFIER	1
3	5280-09012-00	IC2	7442 BCD-DEC DECODER	1
4	5280-09073-00	IC3	7400 QUAD 2 INPUT NAND	1
5	5280-08973	IC4	7408 QUAD 2 INP. AND GATE	1
6	5310-09153-00	IC5	4050 BUFFER	1
7	5310-09154-00	IC6	4068 8 INPUT NAND GATE	1
8	5310-08971-00	IC7	4069 HEX INVERTER	1
9	5250-09157-00	IC8	7805 5 VOLT REG. W/TO 220 CASE	1
10	5430-08972-00	IC10	6821 P.I.A.	1
11	5340-09003-00	IC11	6810 RAM	1
12	5371-09152-00	IC13	1408 D/A CONVERTER	1
13	5160-08938-00	Q2, Q3, Q4	2N4401 NPN TRANSISTOR	3
14				
15	5075-09018-00	ZR1	1N5996A 6.8V ZENER DIODE	1
16				
17	5100-09357-00	BR1	MDA 200/3N253	1
18	5100-09158-00	Y1	BRIDGE RECTIFIER	0
19	5520-09020-00		3.58 MHZ CRYSTAL	1
20	5010-09036-00	R1, R18, R19, R21, R22, R27, R30, R31, R32	RESISTOR, FC, 4.7K OHM, 5% 1/4 WATT	9
21	5010-09358-00	R2 thru R10	RESISTOR, FC, 100 OHM, 5% 1/4W	5
22	5010-09181-00	R12, R15, R28, R36, R38	RESISTOR, FC, 1K OHM, 5% 1/4W	1
23	5010-09161-00	R14	RESISTOR, FC, 1 OHM, 10% 1/2 WATT	1
24	5010-09361-00	R16	RESISTOR, FC, 2.2 OHM, 5% 1/4 WATT	1
25		R17	RESISTOR, FC, 220 OHM, 5% 1/2 WATT	1
26	5010-08983-00	R23, R24, R26	RESISTOR, FC, 3.3K OHM, 5% 1/4 WATT	3
27	5010-09179-00	R25	RESISTOR, FC, 3.3M OHM, 5% 1/4 WATT	1
28	5010-09035-00	R29	RESISTOR, FC, 47K OHM, 5% 1/4 WATT	1
29	5010-09034-00	R33, R35, R37	RESISTOR, FC, 10K OHM, 5% 1/4 WATT	3
30	5010-09039-00	R34	RESISTOR, FC, 10 OHM, 5% 1/4 WATT	1
31	5043-08980-00	C1, C16 thru C23, C31	CAPACITOR, CER., .01 MFD. 50V. +20% -20%	10
32	5043-09065-00	C2 thru C10	CAPACITOR, CER., 470 PFD. 50V. +20%	9
33	5043-09345-00	C11	CAPACITOR, CER., .001 MFD. +20% 100V.	1
34	5040-09365-00	C12, C30, C36	CAPACITOR, ELECT. 1 MFD. 63V. -10 +50%	3
35	5043-08996-00	C13, C24, C35	CAPACITOR, CER., .1 MFD. 50V. +20%	3
36	5040-09165-00	C14	CAPACITOR, ELECT. 1,000 MFD. 16V. +20%	1
37	5040-09164-00	C15	CAPACITOR, ELECT. 470 MFD. 10V. +20%	1
38	5040-08986-00	C25	CAPACITOR, ELECT. 100 MFD. 10V. +20%	1
39	5040-08893-00	C26	CAPACITOR, ELECT. 1,000 MFD. 25V. +20%	1
40	5040-09376-00	C27	CAPACITOR, ELECT. 4700 MFD. 16V. +20%	1
41	5043-09180-00	C28	CAPACITOR, CER. 47 PFD. 1K V. +20%	1
42	5040-09343-00	C29	CAPACITOR, ELECT. 10 MFD. 20V	1
43	5043-09169-00	C32, C33	CAPACITOR, CER. DISC, 27 PFD. 1KV. +20%	2
44	5041-09163-00	C34	CAPACITOR, TANTALUM 2.2 MFD. 15V. +20%	1
45	5041-09031-00	C37	CAPACITOR, TANTALUM 1 MFD. 25V. +20%	1
46	5641-09658-00	SW1	MOMENTARY SWITCH SPDT	1
47	5645-09330-00	DS1	2 STD, DIP SWITCH	1
48	5731-06314-00	F1, F2	4 AMP SLOW BLOW FUSE	2
49	5732-09178-00		FUSEHOLDER	4
50	5705-09172-00		HEAT SINK THERMALLOY #6072B	1
51	5705-09173-00		HEAT SINK THERMALLOY #6071B	1
52	5705-09199-00		HEAT SINK THERMALLOY #6030	1
53	5700-09004-00		24 PIN SOCKET	1
54	5700-08985-00		40 PIN SOCKET	1
55	5791-09027-00	10J1, 10J3	9 PIN MALE CONNECTOR 09-65-1091	2
56	5791-09028-00	10J2, 10J4	4 PIN MALE CONNECTOR 09-65-1041	2
57				
58	4006-01003-06		6-32x3/8" P-PH-S	3
59	4406-01117-00		6-32 HEX NUT	3
60	5010-09534-00		0 OHM RESISTOR	A/R
61	5824-09248-00	TP1 THR TP4	TERMINAL #1502-1	4
62	5010-09363-00	R11	RESISTOR, FC, 5.6K OHM 5% 1/4 WATT	1
63				
64	5019-09362-00	SR1	RESISTOR, 4.7K OHM 10 PIN SIP	1
65	03-7520-1		TIE WRAP	1
66	4703-00007-00		#6 EXT. LOCKWASHER	3
67	20-9229		THERMAL COMPOUND	.01

NOTES:

1. USE THERMAL COMPOUND BETWEEN IC1 AND IC8, AND HEAT SINKS.

2. CAUTION: AVOID STATIC DISCHARGE DAMAGE TO MOS LOGIC.

3. SYMBOLS SHOWN ON COMPONENTS ARE FOR REFERENCE ONLY.

DO NOT SCREEN OR STAMP.

4. OBSERVE INDEX MARK OF ALL INTEGRATED CIRCUITS;

DIODES D1, D2, AND ZR1;

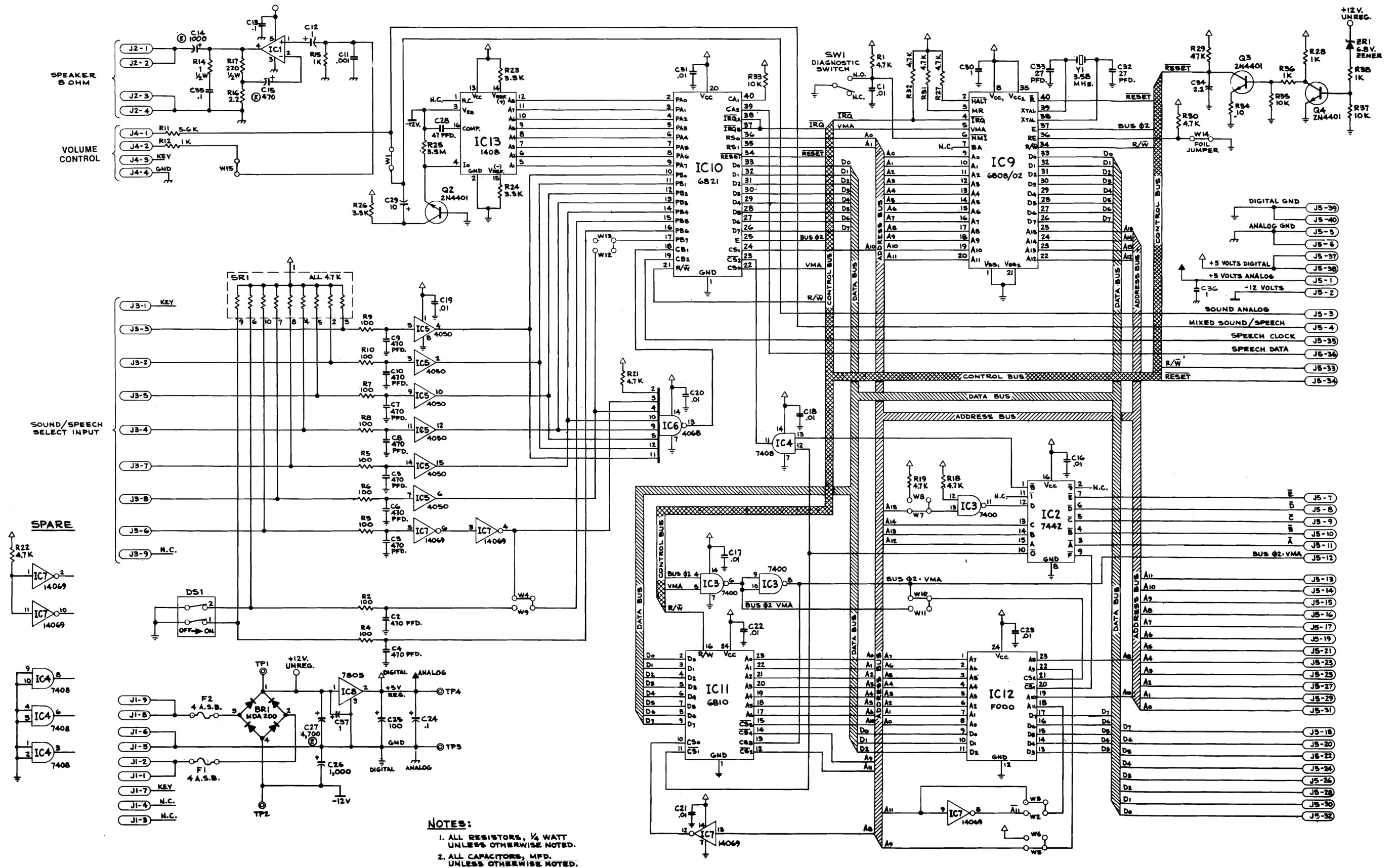
CAPACITORS C12, C14, C15, C25, C26, C27;

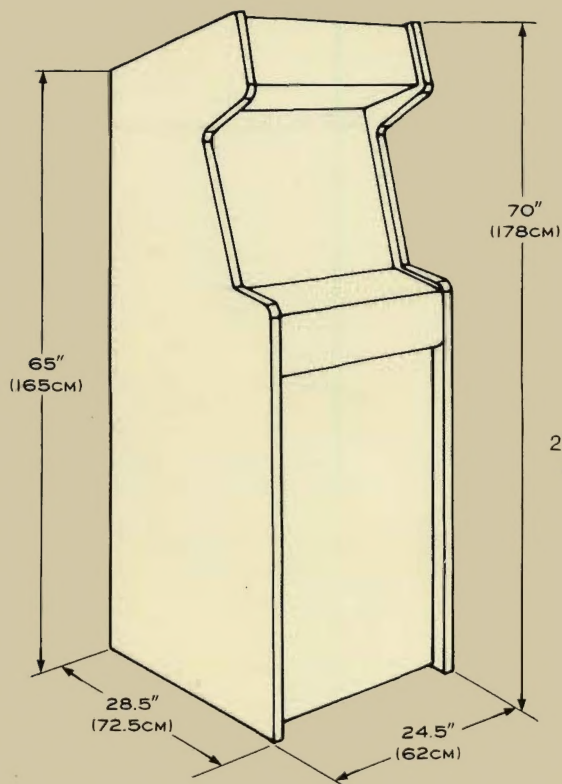
CONNECTORS 10J1, 10J2, 10J4, 10J3, 10J5;

POSITION OF TRANSISTORS Q1, Q2, Q3, Q4.

5. JUMPERS

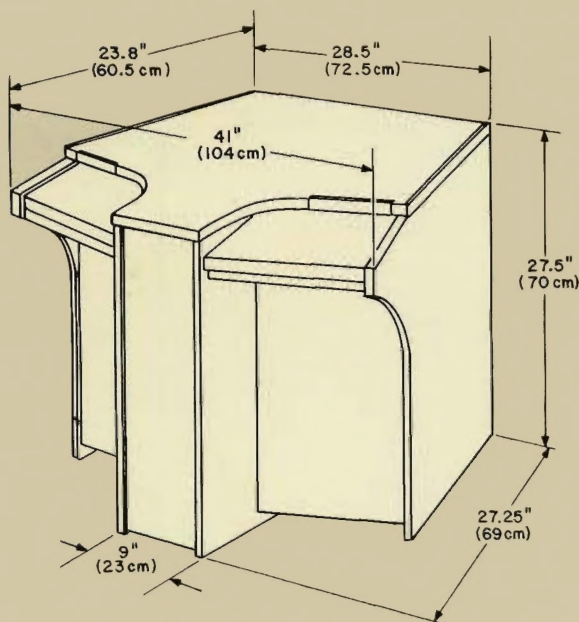
W1) W2)
W3) W6)
W4) W9) OUT
W5) IN W11)
W10) W12)
W13)





UPRIGHT

Weight
270 lbs. (122.5 kg.) uncrated
290 lbs. (131.5 kg.) crated



COCKTAIL TABLE

Weight
205 lbs. (93 kg.) uncrated
220 lbs. (100 kg.) crated

POWER REQUIREMENTS

115/230 VAC Nominal, 50/60Hz
@1.7/0.85A 192W

(20A surge for one cycle
at power turn on)

Normal Line = 98-126VAC
196-252VAC

High Line* = 113-145VAC
226-290VAC

Low Line* = 88-113VAC
176-226VAC

*Transformer jumpers required.
See service manual.

ENVIRONMENT

Operating Temperature
0° to +45°C ambient
(+32° to +113°F)

Storage Temperature
-40° to +65°C ambient
(-40° to +149°F)

90% RH at 40°C (104°F), non-condensing

MONITOR

19" Color Raster*
non-interlaced
UL, CSA & DHHS Approved

VIDEO SYSTEM**

256 Colors, 340 x 240 PIXEL Resolution
6809E Microprocessor
ROM: 48K BYTES
Video and Scratch RAM: 50K BYTES
CMOS RAM: 1Kx4

SOUND SYSTEM**

6808 Microprocessor
ROM: 4K BYTES

JOYSTICK

Two 8-way optical-digital
Two 8-way leaf switch

**Patent pending

Specifications subject to change
without notice.

SERVICE

For the back-up that keeps you out-front,
call Williams toll-free at 800/621-125.
In Illinois, call toll-free at 800/572-1324.

Warning—This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been certified to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to correct the interference.

Williams
ELECTRONICS, INC.

3401 N. California Ave., Chicago, IL 60618
(312) 267-2240, Telex 253095

NOTICE: "SPLAT" is a trademark of Williams Electronics, Inc.

© 1983, WILLIAMS ELECTRONICS, INC.